

U.S.S.N. 10/036,838

IN THE CLAIMS

Please cancel Claims 1, 2, and 11 without prejudice.

Please amend Claims 3-5, 7, 12-15.

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LISTING OF THE CLAIMS

1-2 (cancelled)

3. (Currently Amended) The A method of claim 1 further refreshing memory in a memory device having a bank of N memory blocks, the method comprising the steps of: generating an address for a first one of the N memory blocks as a current first possible refresh block and address for a current second one of the N memory blocks as a current second possible refresh block, for refreshing at least a portion of one of the possible refresh blocks; checking for contention between the current first possible refresh block and an externally generated access to one of the N memory blocks; and permitting the externally generated access to the one of the N memory blocks during a certain interval and initiating an idle external access interval responsive to the following: i) the memory block of the externally generated access contending with the current first possible refresh block, and ii) the current first and second possible refresh blocks being a same one possible refresh block; and
refreshing the one possible refresh block during the idle external access interval.

4. (Currently Amended) The method of claim 1 3 further comprising the steps of: deferring the external access until a certain interval responsive to the following: i) the memory block of the externally generated access contending with the current first possible refresh block, and ii) the current first and second possible refresh blocks being a same one possible refresh block;

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refreshing the one possible refresh block before the certain interval; and
permitting the externally generated access to the one of the N memory blocks during the
certain interval.

5. (Currently Amended) The method of claim 4 3, wherein generating an address for the
current first possible refresh block includes generating an address for a current portion of the
current first possible refresh block, and wherein the method comprises the step of generating an
address for a next portion of the current first possible refresh block responsive to the current
portion not being a last portion of the current first possible refresh block.

6. (original) The method of claim 5 further comprising the step of generating an address
for a portion of a next first possible refresh block responsive to the current portion being a last
portion of the current first possible refresh block.

7. (Currently Amended) The method of claim 2 3, wherein generating an address for the
current second possible refresh block includes generating an address for a current portion of the
current second possible refresh block, and wherein the method comprises the step of
generating an address for a next portion of the current second possible refresh block responsive
to the current portion not being a last portion of the current second possible refresh block.

8. (original) The method of claim 7 further comprising the step of generating an address
for a portion of a next second possible refresh block responsive to the current portion being a
last portion of the current second possible refresh block.

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9. (original) The method of claim 3, wherein generating an address for the current first possible refresh block includes generating an address for a current portion of the current first possible refresh block, and wherein the method comprises the step of generating an address for a next portion of the current first possible refresh block responsive to the current portion not being a last portion of the current first possible refresh block.

10. (original) The method of claim 9, comprising the step of beginning a new refresh cycle for the bank of N memory blocks responsive to the current portion being a last portion of the current first possible refresh block.

11. (cancelled)

12. (Currently Amended) The apparatus of claim 1-13 further comprising:
refresh block compare logic operable for checking whether the first and second address generators are currently designating the same possible refresh block, wherein the apparatus is operable to permit the externally generated access to the one of the N memory blocks during the certain interval, and the multiplexer is operable to select the at least portion of the current second possible refresh block for refreshing during the certain interval responsive to i) the external access compare logic indicating that the memory block of the externally generated access contends with the current first possible refresh block and ii) refresh block compare logic indicating that the current first and second possible refresh blocks are different ones of the N memory blocks.

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13. (Currently Amended) The A memory apparatus of claim 1-1 further comprising:

a memory array segmented into N memory blocks;

first and second address generators, wherein the first address generator is operable to generate an address of a first one of the N memory blocks as a current first possible refresh block and the second address generator is operable to generate an address of a second one of the N memory blocks as a current second possible refresh block;

a multiplexer for receiving the current first possible refresh block and the current second possible refresh block from the respective address generators; and

external access compare logic operable to compare the block of an externally generated access to the current possible refresh block of the first address generator, wherein the apparatus is operable to permit the externally generated access to the one of the N memory blocks during a certain interval, and, the multiplexer is operable to select the at least portion of the current first possible refresh block for refreshing during the certain interval responsive to the external access compare logic indicating that the memory block of the externally generated access does not contend with the current first possible refresh block.;

refresh block compare logic operable for checking whether the first and second address generators are currently designating the same possible refresh block; and

access control logic operable for initiating an idle external access interval responsive to i) the external access compare logic indicating that the memory block of the externally generated access contends with the current first possible refresh block and ii) refresh block compare logic indicating that the current first and second possible refresh blocks are a same one possible refresh block, so that the one possible refresh block may be refreshed during the idle external access interval.

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14. (Currently Amended) The apparatus of claim 11-13 further comprising:
refresh block compare logic operable for checking whether the first and second address
generators are currently designating the same possible refresh block; and
access control logic operable for deferring the external access to a certain interval
responsive to i) the external access compare logic indicating that the memory block of the
externally generated access contends with the current first possible refresh block and ii) refresh
block compare logic indicating that the current first and second possible refresh blocks are a
same one possible refresh block, so that the one possible refresh block may be refreshed
before the certain interval and the external access may be performed during the certain interval.

15. (Currently Amended) The apparatus of claim 11-13, wherein the first address
generator is operable to generate an address for a current portion of the current first possible
refresh block, and, responsive to the current portion not being a last portion of the current first
possible refresh block, to generate an address for a next portion of the current first possible
refresh block.

16. (original) The apparatus of claim 15, wherein the first address generator is operable
to generate an address for a portion of a next first possible refresh block responsive to the
current portion being a last portion of the current first possible refresh block.

17. (original) The apparatus of claim 12, wherein the second address generator is
operable to generate an address for a current portion of the current second possible refresh
block, and, responsive to the current portion not being a last portion of the current second
possible refresh block, to generate an address for a next portion of the current second possible

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refresh block.

18. (original) The apparatus of claim 17, wherein the second address generator is operable to generate an address for a portion of a next second possible refresh block responsive to the current portion being a last portion of the current second possible refresh block.

19. (original) The apparatus of claim 13, wherein the first address generator is operable to generate an address for a current portion of the current first possible refresh block, and, responsive to the current portion not being a last portion of the current first possible refresh block, to generate an address for a next portion of the current first possible refresh block.

20. (original) The apparatus of claim 19, wherein the first address generator is operable to initiate a new refresh cycle for the bank of N memory blocks responsive to the current portion being a last portion of the current first possible refresh block.

21. (original) A memory apparatus comprising:
a memory array segmented into N memory blocks;
first and second address generators, wherein the first address generator is operable to generate an address of a first one of the N memory blocks as a current first possible refresh block and the second address generator is operable to generate an address of a second one of the N memory blocks as a current second possible refresh block;

a multiplexer for receiving the current first possible refresh block and the current second

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possible refresh block from the respective address generators;

external access compare logic operable to compare the block of an externally generated access to the current possible refresh block of the first address generator, wherein the apparatus is operable to permit the externally generated access to access the one of the N memory blocks during a certain interval, and, the multiplexer is operable to select the at least portion of the current first possible refresh block for refreshing during the certain interval responsive to the external access compare logic indicating that the memory block of the externally generated access does not contend with the current first possible refresh block;

refresh block compare logic operable for checking whether the first and second address generators are currently designating the same possible refresh block, wherein the apparatus is operable to permit the externally generated access to access the one of the N memory blocks during the certain interval, and the multiplexer is operable to select the at least portion of the current second possible refresh block for refreshing during the certain interval responsive to i) the external access compare logic indicating that the memory block of the externally generated access contends with the current first possible refresh block and ii) refresh block compare logic indicating that the current first and second possible refresh blocks are different ones of the N memory blocks; and

access control logic operable for initiating an idle interval responsive to i) the external access compare logic indicating that the memory block of the externally generated access contends with the current first possible refresh block and ii) refresh block compare logic indicating that the current first and second possible refresh blocks are a same one possible refresh block.